Title: **Analysis and modelling of non-stationary components of the gravity field using Hybrid Gravimetry in the Campi Flegrei area**

**Tutor: Riccardi U.**

**Co-tutors: Pivetta T., Carlino S.**

**Research program**

It is proposed to develop a PhD project aimed at monitoring mass redistribution processes at depth in the Campi Flegrei volcanic area using innovative gravimetric techniques. The state of the art testifies that the integrated use of absolute and relative gravimeters, in continuous recording and in discrete acquisition, allows a higher spatio-temporal resolution necessary to detect the non-stationary components of the gravity field (Portier et al., 2018; Pivetta et al. 2023). The chosen target area will be the Campi Flegrei caldera, where the most intense dynamics are observed at present. This methodology will necessarily have to integrate the monitoring of ground deformations, in order to resolve the elasto-gravitational variations associated with the volcanic phenomena underway and to be able to separate the deformation contribution from the “Newtonian” one. In addition to data analysis, inverse modelling of mass redistribution phenomena will be attempted. The project will be developed and directed in synergy with the Functional Unit (UF4) of “Geodetic Monitoring of the Osservatorio Vesuviano, Naples section of the INGV and will make use of relative and absolute survey gravimeters and 2 relative gravimeters specifically designed for permanent recordings: a spring one, currently operating at Astroni and a superconducting gravimeter, which will be installed in early June 2024 at Rione Terra (Pozzuoli). The continuous recording gravimeters will allow maximum time resolution at selected points, while the repeated measurement of the network with relative and absolute gravimeters will allow reconstruction of the spatial patterns of the gravity variations. The repeated absolute measurements will further provide a constraint on the instrumental drifts of the permanent stations. The detected gravity variations will be modelled and interpreted in order to better understand the volcanic processes occurring in the Campi Flegrei caldera and the possible causes of the unrest.

# Research Program

**1st Year**: Bibliographic research and study of the theoretical foundations of gravity signal analysis. Use of softwares for processing gravity records as well as measurements acquired on networks.

**2nd Year**: Data analysis; 4-month internship abroad (GFZ Potsdam or École et Observatoire des Sciences de la Terre, University of Strasbourg) to study advanced techniques for gravity data analysis and Inverse methods. Attendance of international conferences, writing peer-reviewed articles.

**3rd Year**: Interpretation of results; Presentation of results at International Conferences and in peer-reviewed articles. PhD writing.